

DIN EN 15502-1:2024-08 (E)

Gas-fired heating boilers - Part 1: General requirements and tests (includes Amendment A1:2023)

Contents		Page
European foreword		9
Introduction		11
1	Scope	12
2	Normative references	13
3	Terms, definitions and symbols	15
4	Classification	36
4.1	Gases and categories	36
4.2	Mode of air supply and evacuation of the combustion products	36
4.3	Maximum water-side operating pressure	36
5	Construction	36
5.1	General	36
5.1.1	General requirements	36
5.1.2	General verification	37
5.2	Conversion to different gases	37
5.3	Materials	37
5.3.1	General	37
5.3.2	Materials and thicknesses of walls or tubes with water side operating pressure for boilers of pressure class-3	38
5.3.3	Domestic water connections	39
5.3.4	Thermal Insulation	39
5.3.5	Materials in contact with water for human consumption	39
5.3.6	Durability against corrosion of metallic combustion product circuits	40
5.4	Method of construction	41
5.4.1	Design	41
5.4.2	Checking the state of operation	42
5.4.3	Use and servicing	42
5.4.4	Connections to the gas and water pipes	43
5.4.5	Soundness	43
5.4.6	Supply of combustion air and evacuation of the combustion products	44
5.4.7	Dampers	44
5.4.8	Air proving	44
5.4.9	Gas/air ratio controls	45
5.4.10	Fan	46
5.4.11	Drainage	46
5.4.12	Operational safety in the event of failure of the auxiliary energy	46
5.4.13	Special provision for Low Temperature Boilers and Condensing Boilers	46
5.5	Burners	47
5.6	Pressure test points	48
5.7	Requirements for the application of control and safety devices	48
5.7.1	General	48
5.7.2	Adjusters and range-rating devices	48
5.7.3	Gas circuit	49
5.7.4	Gas pressure regulator	50
5.7.5	Ignition devices	51
5.7.6	Flame supervision devices	51

5.7.7	Gas/air ratio control tubes	52
5.7.8	Thermostats and water flow temperature limiting devices	52
5.7.9	Remote control	53
5.7.10	Expansion vessel and pressure gauge	54
5.7.11	Protection against frost for boilers intended to be installed in a partially protected place	54
5.7.12	Adjusting, control and safety devices for the domestic hot water circuit	55
6	Electrical and electromagnetic safety	55
7	Controls	55
7.1	General	55
7.2	Detailed specifications	56
7.2.1	Control and safety devices	56
7.2.2	Valves used in boilers	56
7.2.3	Not relevant aspects for controls tested in combination with the boiler	56
7.2.4	Relevant aspects for controls tested in combination with the boiler	57
7.3	Thermostats and flow temperature limiting devices	57
7.3.1	General	57
7.3.2	Construction requirements	58
7.3.3	Performance	59
8	Operational requirements	61
8.1	General	61
8.1.1	Characteristics of the reference and limit gases	61
8.1.2	General test conditions	62
8.2	Soundness	66
8.2.1	Soundness of the gas circuit	66
8.2.2	Soundness of the combustion circuit	67
8.2.3	Soundness of the water circuit	67
8.2.4	Soundness of the domestic water circuit	68
8.3	Hydraulic resistance	68
8.3.1	Requirements	68
8.3.2	Test conditions	68
8.4	Heat inputs and heat output	69
8.4.1	Determination of the nominal heat input or the maximum and minimum heat input	69
8.4.2	Adjustment of the heat input by the downstream gas pressure	71
8.4.3	Ignition rate	71
8.4.4	Nominal output	71
8.4.5	Verification of the nominal condensing output	71
8.4.6	Nominal domestic hot water heat input	72
8.4.7	Water pressure to obtain the nominal heat input for instantaneous combination boilers ..	72
8.4.8	Obtaining the domestic hot water temperature for instantaneous combination boilers	72
8.4.9	Heating-up time of the domestic hot water	73
8.5	Limiting temperatures	73
8.5.1	General	73
8.5.2	Limiting temperatures of the adjusting, control and safety devices	73
8.5.3	Limiting temperatures of the side walls, the front and the top	74
8.5.4	Limiting temperature of the test panels and the floor	74
8.6	Ignition, cross lighting, flame stability	75
8.6.1	General	75
8.6.2	Limit conditions	75
8.6.3	Special flue conditions	76
8.6.4	Reduction of the gas rate of the ignition burner	77
8.7	Reduction of the gas pressure	77
8.7.1	Requirements	77
8.7.2	Test conditions	77
8.8	Defective closure of the gas valve immediately upstream of the main burner	77
8.8.1	Requirements	77
8.8.2	Test conditions	78
8.9	Pre-purge	78
8.10	Functioning of a permanent ignition burner when the fan stops during the standby time .	78
8.10.1	Requirements	78

8.10.2	Test conditions	78
8.11	Adjustment, control and safety devices	78
8.11.1	Requirement	78
8.11.2	Test method for determining the operating temperature range	78
8.11.3	Combination Boilers	79
8.11.4	Control devices	82
8.11.5	Ignition devices	82
8.11.6	Flame supervision device	84
8.11.7	Gas pressure regulator	87
8.11.8	Thermostats and flow temperature limiting devices	88
8.12	Carbon monoxide	90
8.12.1	General	90
8.12.2	Limit conditions	92
8.12.3	Special conditions	92
8.12.4	Sooting	93
8.12.5	Condensate discharge blockage test	94
8.13	NO _x	94
8.13.1	Requirement	94
8.13.2	Test methods	95
8.13.3	Calculation of emissions of NO _x in mg/kWh based on GCV	97
8.14	Special provisions for boilers intended to be installed in a partially protected place	98
8.14.1	Frost protection system for boilers intended to be installed in a partially protected place	98
8.14.2	Protection against the ingress of rain	98
8.15	Formation of condensate	98
8.15.1	Requirements	98
8.15.2	Test conditions	98
8.16	Temperature of combustion products	99
8.16.1	Requirements	99
8.16.2	Test conditions	99
8.17	Sound power level LWA	99
9	Useful efficiencies	99
9.1	General	99
9.1.1	Correction of measured efficiency to reference conditions	99
9.1.2	Use of the general test conditions	100
9.2	Useful efficiency at the nominal heat input	100
9.2.1	Requirements	100
9.2.2	Tests	100
9.3	Useful efficiency at part load	102
9.3.1	Requirements	102
9.3.2	Tests	102
9.4	Heat output, Seasonal energy efficiency and energy consumption	109
9.4.1	Rated heat output (Prated and P4)	109
9.4.2	Useful heat output at 30% of rated heat output and low-temperature regime (P1)	109
9.4.3	Useful efficiency (GCV) at rated heat output and high-temperature regime (4)	109
9.4.4	Useful efficiency (GCV) at 30% of rated heat output and low-temperature regime (1)	110
9.4.5	Ignition burner power consumption (GCV) (Pign)	110
9.4.6	Calculation of the seasonal space heating energy efficiency (s)	110
9.4.7	Calculation of the annual energy consumption for space heating (QHE) (GCV)	112
9.4.8	Water heating energy efficiency and energy consumption of combination boilers for water heating mode	112
10	Electric auxiliary energy	113
10.1	Auxiliary energy consumption	113
10.1.1	General	113
10.1.2	System boundaries	113
10.1.3	Auxiliary energy at nominal heat input	113
10.1.4	Auxiliary energy at part load	114
10.1.5	Auxiliary energy at stand-by	114
10.2	Auxiliary electricity consumption measurements required for eco-design and labelling regulations	114
10.2.1	General	114

10.2.2	System boundaries	114
10.2.3	Auxiliary electricity consumption [kW] at nominal heat input	115
10.2.4	Auxiliary electricity consumption at part load [kW]	115
10.2.5	Auxiliary electricity consumption at stand by [kW]	115
11	Risk assessment	115
12	Marking and instructions	116
12.1	Boiler marking	116
12.1.1	Data plate	116
12.1.2	Markings related to the state of adjustment	117
12.1.3	Packaging	117
12.1.4	Warnings notices on the boiler and the packaging	117
12.1.5	Other information	118
12.2	Instructions	119
12.2.1	Instructions for installation	119
12.2.2	Instructions for use and servicing	124
12.2.3	Conversion instructions	124
12.3	Presentation	125
Annex A (normative) Properties of carbon and stainless steels		133
Annex B (normative) Minimum requirements for cast iron		134
Annex C (normative) Parts in aluminium and aluminium alloys		135
Annex D (normative) Parts in copper or copper alloys		136
Annex E (normative) Minimum thicknesses for rolled parts		137
Annex F (normative) Nominal minimum thicknesses of boiler sections of cast materials under water pressure		138
Annex G (normative) Parameters for welded joints and welding processes		139
Annex H (informative) Examples of the composition of the gas circuit according to 5.7.3.2		144
Annex I (informative) Compilation of the test conditions for the various gas families		153
Annex J (normative) Calculation of conversions of NO _x		155
Annex K (informative) Example of calculation of the weighting factors NO _x		157
Annex L (informative) Practical method of calibrating the test rig to enable the heat loss D _p to be determined		159
Annex M (informative) Means of determining the ignition time at full rate		160
Annex N (informative) Determination of the heat losses from the test rig of the indirect method and the contributions of the circulating pump of the test rig		161
Annex O (informative) Example of a risk assessment method		162
Annex P (informative) Examples of risk assessment with a method described in Annex O		165
Annex Q (informative) Realisation of a protective measure		170
Annex R (informative) Overall classification of a basic risk		172
Annex S (informative) Not exhaustive list of classification examples		175

Annex T (normative) Correction for the determined efficiency in the low water temperature test of low temperature boilers (LTB) and condensing boilers (CB)	178
Annex U (normative) Use of test gases	180
Annex V (informative) Alternative method for heat output as enthalpy difference	181
Annex AA (informative) Product Information related to Eco-design Regulation and Labelling Regulation	184
Annex AB (informative) Variations in gas quality	188
Annex AC (normative) Non-exhaustive list of materials used in contact with drinking water	193
Annex ZA (informative) Left empty on purpose	195
Annex ZB (informative) Clauses of this European Standard addressing the methods for the verification of the efficiency of the EU Directive 92/42/EEC, relating to the efficiency of new hot boilers with an output of 4 - 400 kW	196
Annex ZC (informative) Relationship between this European Standard and the eco- design requirements of Commission Regulation (EU) No 813/2013 L 239/136 aimed to be covered	197
Annex ZD (informative) Relationship between this European Standard and the energy labelling requirements of Commission Delegated Regulation (EU) No 811/2013 L 239/1 aimed to be covered	200
Annex ZE (informative) Relationship between this European Standard and the essential requirements of Regulation (EU) 2016/426 of the European Parliament and of the Council of 9 March 2016 on appliances burning gaseous fuels and repealing Directive 2009/142/EC aimed to be covered	203
Bibliography	213